USE OF INDIGENOUS KNOWLEDGE IN STRATEGIES FOR DISASTER RISK REDUCTION FOR FLOOD DISASTER: THE STUDY OF THARU COMMUNITY OF BARDIYA DISTRICT OF NEPAL

A Dissertation for the Degree of Master in Disaster Management

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Abstract

The main aim of this study was to explore the use of indigenous knowledge and practices in Tharu Community to reduce the impact of flood disasters. Disasters are more frequent and prominent at the present. Nepal is not an exception either. When the disaster strikes, it is poor and marginalized groups that suffer the most. Tharu Community in Nepal is one of the marginalized and vulnerable communities for flood hazards. Hence it is crucial to increase the understanding about the ways which impacts of extreme events can be reduced.

To carry our Disaster Risk Reduction approaches, it is first required to understand what community needs. Promotion of new risk reduction options needs to consider local tradition and norms to ensure their acceptability by the local people. In spite of huge investments in the area of disaster management, losses continue to mount. The need to bridge the gap between practice and policy with the recognition of indigenous knowledge and local coping strategies is the must. Hence this paper is an attempt to understand the local practices used by Tharu Community.

The research showed that the community people did have knowledge regarding the changing climate and are putting their own efforts in order to cope up. They have their own ways of forecasting and early warning systems. They are using the traditional ways of embankment in order to minimize the adverse effects of flood. However, the indigenous practices which proved to be useful in the past years were not enough to cope with the rapid change in climatic patterns. Need to integrating scientific strategies in these indigenous practices is a must.

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LIST OF ACRONYMS

CBS	Central Bureau of Statistics
DDC	District Development Committee
DRR	Disaster Risk Reduction
ICIMOD	International Center for Integrated Mountain Development
IFRC	International Federation of Red Cross
IK	Indigenous Knowledge
IPPC	International Plant Protection Convention
ISDR	International Strategy for Disaster Reduction
IUCN	The World Conservation Union
MoHA	Ministry of Home Affairs
NGOs	Non Government Organizations
NSDRM	National Strategy for Disaster Risk Management
SDMC	SAARC Disaster Management Center
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNISDR	United Nations International Strategy for Disaster Reduction
VDC	Village Development Committee

Chapter 1 Introduction

Effect of Climate change is seen worldwide and Nepal is no exception either. Nepal's temperature is increasing at a rate of 0.04-0.06 degree Celsius per annum within the last 30-40 years. Because of the increase in temperature, already impacts on ecological zones can be seen. Throughout the country the effects are already being felt. There are changes in rainfall pattern, summers are hotter and winters are colder. Monsoon rain has become more intensive resulting in the increased frequency of flash floods and landslides. This has increased different types of disasters among which water induced disasters are more prominent.

In a developing country like Nepal, many development plans are poorly prepared at the central level without consulting the local communities and representing the felt needs of the target communities. Such development plans prepared without consulting the target communities are not only unsustainable but are also expensive and create negative perceptions towards the development activities on the part of the local communities.

Flawed development initiatives in many areas of Nepal have created disaster or hazard such as the breach of irrigation channels, building constructed in vulnerable areas, poor housing plans, etc. Due to flawed disaster management, the ratio of people killed to affected population in Nepal is highest in the region (Thapa, 2002).

Understanding the recent changes in climate and disaster trends is important to realize the challenge that disaster pose and the need to search for the additional or alternative ways to reduce the risk of disaster. During disaster, mainly marginalized and economically disadvantage groups are affected. This is mainly due to the reasons such as: they live in particularly vulnerable areas and they have very limited or no access to aid and support after the extreme event. Indigenous people on the other hand have contributed their wisdom on the use of natural resources and reduce the risk inflicted by natural hazards. But none of the national policies of Nepal has emphasized in the documentation and study of IK and its relevant issues (Sharma, et. al, 2009).

1.1 General Background

Nepal is a country which is located in South Asia, sharing borders with India and China. With an area of 147,181 square kilometers, Nepal is divided into main three geographical regions; the Himalayan region which covers 15% of the total area, the hilly region which covers 68% and Terai also known as the food basket of the country covers 17% of the total area. Natural disasters are very common and frequent in Nepal. Due to country's topography, climatic pattern and lack of needed infrastructure planning make it extremely vulnerable to various kinds of natural hazards.

Every year thousands of families are affected and are being homeless due to natural disasters. Landslides are considered as a threat to the hill communities. Roads and transportation facilities gets affected as it gets blocked every year. Mainly Eastern Terai, Western and mid Western Terai and Hilly districts suffer from landslides and floods. Also, as most of the areas of Nepal lie in high seismic risk zone, earthquake is considered as the largest threat, basically in the urban areas where population density is very high. According to UNDP's Bureau of Crisis Prevention and Recovery, Nepal ranks as 11^{th} most at risk country to earthquake and 13^{th} most at risk to floods. (2004)

National disaster risk management practices in Nepal are mainly focused on core government functions and micro-level disaster analysis does not get addressed in these plans. The main challenge of disaster management in Nepal is the absence of proper policy formulation and implementation and strategic plan for prevention and preparedness. Due to unstable political situation and lack of proper coordination among authorities, nation plan for disaster management has not been implemented successfully. The system of hazard mapping, vulnerability assessment has yet to be properly developed. Focus is still given to the post disaster activities i.e. rescue and relief work rather than prevention and preparedness.

After a decade of armed conflict, a peace settlement in 2006, Nepal is in the period of political transition. There still is an ongoing negotiation by an interim legislature parliament over a new constitution. The legislatives reform processes have slowed and become less clear, so has the process of implementation of new policy. This has brought upon impact for disaster risk reduction. Due to the absence of district and local elections over last decades,

the levels of government from the perspective of disaster management has weakened. (IFRC, 2011)

In the report presented by Government of Nepal in World Conference on Disaster reduction, it is stated that Nepal does not have traditional indigenous knowledge wisdom and practices or trained programs on disaster risk reduction. The traditional indigenous practices for disaster risk reduction are to sacrifice goats and other animals and pray to go to reduce the risk of disaster. But there are various evidences which prove that in fact indigenous practices are prevalent in Nepal. The wisdom and possessed by local inhabitants has emerged as a means to survive under remote isolated and harsh conditions in mountainous region of Nepal (Sharma S, 2009). Recognition of Indigenous knowledge in Disaster Risk reduction efforts has been insufficient even though there are evidences that these practices have potential to provide solutions.

Nepal lacks systematic and in-depth studies in indigenous knowledge. Though there are reports which talk about the importance of indigenous knowledge for Natural resource management in Nepal, literature on indigenous knowledge for disaster risk reduction is limited and scarce. (ISDR, 2008)

What is needed and accepted locally can be indentified and understood through the in-depth study of local knowledge and practices. This will help to understand how people's participation can be increased in DRR. Taking local knowledge and practices into considerations helps in promoting mutual trust, common understanding and the community's sense of ownership and self confidence. If there is incorporation of indigenous practices in the existing practices and policies, the community will get encouraged and it empowers them to take the leading role in disaster risk reduction activities.

Indigenous people have contributed their wisdom on the use of natural resources and restoration. But none of the national policies in Nepal has emphasized the documentation and study of IK and issues (Sharma, S. et. al, 2009). Marginalized communities have a large and diverse body of knowledge on disaster mitigation based on traditional wisdom. Since they live in remote, isolated and inaccessible areas on the ridges or on the foothills, they have their own coping strategies in times of disaster. Detailed, systematic and intensive studies on

indigenous knowledge would contribute to a more comprehensive understanding an appreciation of their overall contribution for better and safer living conditions of the people. (UN/ISDR, 2008)

1.2 Statement of the problem

Nepal is highly vulnerable to climate change impacts. Country's temperature is increasing at a high rate of 0.06 degree Celsius per year (Shrestha et.al, 1999). Various marginalized communities are also experiencing this increment and are facing some extreme weather events such as erratic rainfall, droughts, landslide etc. Impact of the climate change is more to the livelihood of those who depend on forest, land or nature for their food and income. IPPC Third Assessment Report states that the communities who live in marginal lands and whose livelihood are highly dependent on natural resources are among the most vulnerable to climate change.

Tharu, the indigenous people of Terai region are the most vulnerable people which are being affected by the climate change. Though they have adapted to natural hazards through their traditional knowledge and survival skills, the current changes in climate and its impact could be overwhelming to deal with. Livelihood diversity of Tharu is limited than those of communities from other areas. Hence it is important to understand the level of impact on their livelihood.

Even though Tharus have been residing in Terai region and have been adapting to the climatic variation from the ancient time, their lives have started to be affected by climatic anomalies which is more likely to be damaging in the near future. The knowledge that these communities have acquired over time needs to be well understood so that appropriate techniques can be recommended for their betterment.

Chapter 2 Literature Review

2.1 Overview of Flood in Nepal

Floods are common phenomenon in Nepal. There are more than 6,000 rivers and rivulets nationwide. Among these, Koshi, Narayani, Karnali and Mahalaki are considered as main rivers. They originate from the Himalayas, descend from the hills and flow through terai plains. During monsoon which is basically June to September, these rivers rise up and cause damage to the areas within their flood plains. Mainly, the districts like Baglung, Banke, Rautahat, Bardiya and Sindhuli suffer great damage due to flood. Floods in Nepal are classified into two: Riverine and Flash floods. (ICIMOD, 2007)

Nepal experience intense rainfall for four months from June to September which contribute to 80% of annual rainfall. These intense rainfall causes flood as it gives rise to major rivers of Nepal. These floods generally rise slowly n the Southern Terai Plains. Inundation caused by overflowing of river banks causes extensive damages in the various regions of Terai (ICIMOD, 2007). Flash floods are floods which occur without warning. These are considered more dangerous as they occur suddenly and flow with very high speed. They are triggered by extreme rainfall, failure of dams etc.

Flood of 1993 is considered as one of the major floods in Nepal. It caused massive destruction of life and property, thousands of people were homeless and it also destroyed crops over thousands of hectares of land. During this flood, 45 districts of the country were affected. The total loss of physical destruction was estimated to be Rs. 5 Billion. Similarly, other major floods of Nepal are the 1978 flood in the Tinao Basin, the 1980 flood along the Koshi River. Also, the central and eastern Terai was submerged during the flood of 1987 in Sunkoshi Basin (ICIMOD, 2007).

Many villages in the Terai area get flooded every year because of barrages and embankments built in India by interfering with natural drainage cause water logging. The embankments built long the Bagmati, Karnali and West Rapti rivers close to the border have constrained the flow of rivers and contributed to the inundation of about 27 border localities. (MoHA, 2009)

Disaster adversely affects Nepal's entire economy but the poor and vulnerable suffer the most because they have limited options for rebuilding their livelihoods after a disaster strikes. Marginalized group of Nepal are forced to reduce their food consumption, sell livestock which ultimately have a negative effect on their future. Hence, DRR efforts should be mainstreamed in order to change this overall context. (MoHA, 2009)

2.2 Concept of Disaster Risk reduction (DRR)

DRR can be seen as 'the systematic development and application of policies, strategies and practices to minimize vulnerabilities, hazards and the unfolding of disaster impacts throughout a society in the broad context of sustainable development (UNISDR, 2004). According to the report by Concern, Disaster Risk reduction is a means of bridging the gap between development and humanitarian programs. In the same report it is written that Disaster Risk Reduction (DRR) measures are designed to protect livelihoods and the assets of communities and individuals from the impact of hazards by:

- *Mitigation: reducing the scale, intensity and impact of hazards.*
- *Preparedness: strengthening the capacity of communities to withstand, respond to and recover from hazards, and of government, implementing partners and Concern to establish speedy and appropriate interventions when the communities' capacities are overwhelmed.*
- *Advocacy: favorably influencing the social, political, economic and environmental issues that contribute to the causes and magnitude of impact of hazards. DRR is often a complementary or integral part of other programmes such as micro-finance.*

Disaster Risk reduction measures are undertaken in order to build local resilience. They strengthen the social capacity to respond to changing conditions, including the stress inflicted by disasters (MoHA, 2009). A holistic approach to disaster risk reduction includes all three process of disaster management; Preparedness, rescue and recovery.

2.2.1 Disaster Risk Reduction in Nepal

In 2009, Government of Nepal adopted a National Strategy for Disaster Risk Management (NSDRM). Also, there is a revised draft bill for a new disaster management act that will soon go to cabinet (IFRC, 2011). Apart from this, the necessity of integration of DRR and

development goals has been recognized at national government level in Nepal in its national developing planning, its National policy on Environmental adaptation to climate change.

Some of the major gaps which can be seen in legal framework for DRR in Nepal are as follows:

- The current legislation focuses only on rescue and response operation and there is no comprehensive and broadly based Disaster Management Act.
- There is not yet a comprehensive and adequately resourced mechanism to implement the national building codes to guard against the risk of earthquake and fire.
- Land use planning is not clearly regulated.
- There is no effective early warning system. Relevant government entities which collect information or provide communications do not have specific mandates to share information with communities and disaster related communication.
- Existing legislature does not set requirement for risk mapping at community level. Also there is no recognition of importance of indigenous knowledge and practices.

2.3 Understanding Indigenous Knowledge

It is found from the various literatures that local people are aware of the changing climate and they develop their own adaptation measures based on their cultural practice and past experiences. People always find ways to live with the environment using the knowledge they have gained through their ancestors. This knowledge is usually in the form of social practices and behaviors. In many countries these knowledge are manifested in the form of songs, folklores, and also proverbs which usually becomes the part of cultural beliefs and practices. The origin of indigenous knowledge lies within the communities though it is often influenced by outside sources over time. Exchanges of information between different cultures have taken place since early days. The process of developing IK, whether incorporating outside knowledge or not is decided solely by the community itself. (Baumwoll, 2008) “Indigenous knowledge refers to approaches and practices of a culture which develop from an advanced understanding of its specific environment which has formed over numerous generation of habitation.” (Baumwoll, 2008)

According to Berkes (1999), Indigenous knowledge is part of local knowledge and it refers to: “local knowledge held by indigenous people or local knowledge unique to a given culture

or society." United Nations Environment Program (UNEP) has defined Indigenous knowledge as the knowledge that an indigenous community accumulated over generations of living on a particular environment. It means all the form of knowledge which enables the community to achieve stable livelihood in the environment. This can be in the form of technologies, skills, practices, beliefs as well as cultures. IK is used in different areas including health, education, natural resource management etc (Warren 1998). These knowledge systems include all areas of life as they are developed by people for survival.

Lousie Grenier in a publication by International Development Research Center (IDRC) has defined IK as, "the unique, traditional, local knowledge existing within and developed around the specific conditions of women and men indigenous to a particular geographic area." Similarly, UNESCO claims that local and indigenous knowledge connect directly to the natural world and the specific environmental context.

Indigenous knowledge on disaster risk reduction can mainly be classified into four categories:

a) **Technological**: Indigenous technology is seen in almost every part of the world. Technology is used almost in every aspect of the life. These traditional practices are seen to be more effective foe the community than scientific practices. Like in some cases, most of the communities have intimate knowledge about the quality of soil, plants and seeds that are resistant to drought o flood. Farmers who work in the marginal lands practice mixed cropping, intercropping techniques which reduces risk of poor harvest. Also at many places, houses are constructed on raised platform so that they remain above flood levels. Technologies can be seen to be used while constructing earthquake resistance building or houses as well.
b) **Economic**: Communities have developed their indigenous economic strategies to deal with the disasters. Usually vulnerable households try to store up grains, foods and cash which they can draw on in difficult times. In the case of food shortage, natural or wild foods from the forests are used such as roots, berries etc.
c) **Social**: This basically includes kinship networks, mutual aids and self help groups. Sharing of foods, materials during the crisis can be seen in many communities. Also, people's joint participation to rebuilt or reconstruct the damaged infrastructures can be seen after the disaster event.

d) **Cultural**: This includes religious beliefs and norms which helps the community in perceiving warning systems about the disaster and provide the medium to pass on the knowledge and experiences from one generation to another generation. This is passed on in the forms of stories, tales as well as other practices.

In the report presented by Joshi V, et. al, Indigenous knowledge refers to the age old refined methods and practices developed by previous generation from an advanced understanding of local environment, to save their belongings and lives from any future natural disaster. The local people observe signs in environment which allows them to take precautions before disaster happens.

SDMC in its published report presents that Indigenous practices varied from one area to another and even within the same area, it varies from one community to another community. The knowledge and practices keep changing with the time. The communities learn to adapt to the changing contexts and challenges.

According to the report presented by ISDR, there are mainly four arguments related to the value of indigenous practices.

- Knowledge regarding strategies to cope against natural disaster can be transferred from one community to another community in the similar situations.
- Affected community gets encouraged if there is an incorporation of indigenous knowledge in existing practices and policies. This empowers the members of the community to take the leading role in all disaster risk reduction activities.
- Information contained in indigenous knowledge can help improve project implementation by providing necessary information about the local context.
- Non-formal means by which indigenous knowledge is disseminated provides a successful model for the other education on disaster risk reduction.

The indigenous knowledge, a product of anthropological geophysical and climate attributes, truly empowers a community in terms of having defined risk reduction strategies via anticipation, coping, adaptation and recovery. Anticipation and prediction make community

better prepared to face the impact of the disaster. When a disaster strikes, they respond, adapt and cope using their indigenous knowledge. (www.preventionweb.com)

2.3.1 Indigenous Community

Indigenous communities are those having a historical continuity with pre-invasion and pre-colonial societies that developed on their territories; consider themselves distinct from other sectors of society and now prevailing in territories or parts of them. (Khatiwada, 2011)

With distinct language, religion, customs, folklore, culture, knowledge, ancient territory, 59 indigenous nationalities are legally recognized in Nepal (NEFIN, 2010). Nepalese indigenous nationalities are excluded from main streams of national policies and are being legally apart from their ancient natural heritages, biodiversity, skills, technology, traditional ethics and many more. In the report presented by ISDR in 2008, it is stated that knowledge on disaster mitigation has been found to be stronger in homogenous and tribal communities rather than in migrant communities. In Nepal, Gurung and Tharu communities possess more knowledge on disaster mitigation due to the presence of strong sense of solidarity and harmony within the community.

2.4 Indigenous Knowledge In DRR

According to Dekens, Indigenous people have adjusted their livelihood strategies to adapt to gradual change for centuries, but new global pressures have significantly changed people's social, economic, political and environmental contexts. While moving forward with DRR strategies, it is necessary to take an account to the interrelated human, societal and cultural factors along with the physical hazard risk. (Wisner et. Al. 2004)

Basically, the interest in the indigenous knowledge entered the development discourse during the 1980s (Chambers). In 1990s, experts continued to explore the alternative approach to development and its consideration of Indigenous Knowledge. During this period, the international community began to catch on an introduce IK into the debates. (Denkens, 2007)

Knowledge originated from communities was not given any emphasis as scientific technologies are considered to be more effective. According to Wisner et, al, (2004), narrow focus on post disaster activities overlooks the interrelating factors which may contribute to a

hazard becoming a disaster and ignores the depth of knowledge existing within communities that face such risk. This has lead to an abandonment of Indigenous strategies. Traditional knowledge which is not based on facts is often dismissed by policy makers in favor of scientific methodology (Mercer, et. al 2007).

Although IK is not based on the scientific facts, they are formulated on the basis of past observation and have been proven to be closely matched with scientific reality as indigenous measures do enable adaptation to harsh environment in many cases (Shrestha, 2011). But the interest in IK has been extremely slow in entering the field of DRR. Experts agree on the facts that the links between DRR and indigenous knowledge have seldom been made in either literature or practice (Dekens). The reason for this delay according to Dekens is that until now disasters have been focused only on technological solutions including stronger infrastructure, high tech warning systems etc.

It was not until the beginning of the twenty-first century that the values of indigenous knowledge became reflected in policies and practices of DRR organizations. Several projects have been initiated by international organizations over past few years which focus on compiling and dissemination of indigenous practices as a means of spreading valuable knowledge and strategies to different communities (Boumwoll, 2008). ICIMOD in the support of European Commission through its Humanitarian Aid Development, initiated a fifteen month project. This study provided a collection of publication by Julie Dekens which analyzes the value of indigenous knowledge for DRR. The field of sustainable development also began to recognize the importance of IK. The World Summit on sustainable development (2002) made several referenced to IK and its importance for sustainability (Dekens).

In recent years, shift in the approach to DRR can be found with and introduction of the vulnerability approach, a focus on pre-disaster activities and an inclusion of the affected community. These three changes support the inclusion of knowledge held by local people in preparedness and mitigation strategies to help reduce the vulnerability of disaster-prone communities (Boumwoll, 2008). At the moment, organizations have shifted their approach to DRR from technology focused activities and towards emphasis on reducing vulnerability of the community. These shifts have led DRR experts to consider integration of Indigenous

Knowledge in DRR policy and practice. IK refers to approaches and practices of a culture which has been developed from an advanced understanding of a specific environment which has been formed and passed down from many generations. Many indigenous communities understand their local environment and care for it maintain lessons for past disasters and are dedicated towards the place they live in. Hence the use of indigenous knowledge in the field of DRR is an additional tool that can help indigenous and vulnerable communities.

There were several examples of the stories which became highlighted after the Indian Ocean tsunami. During the Tsunami, the experiences of communities such as Simeuleans and the Moken, who both relied on the IK for survival, received international attention. Their stories were highly publicized by various publications, newspapers, news programs etc. This made people realize the importance of indigenous knowledge and initiated the discussion on the possibility of improving DRR by incorporation IK in it.

DRR should involve the incorporation of indigenous knowledge alongside scientific knowledge. Even though research and development organizations have acknowledge the existence and importance of indigenous knowledge and strategies related to disaster risk reduction in practice, little documentation of its application through official channels exists (Denkens).

2.5 Case Study: Success study of UNDP's project integrating IK in DRR

Since 2001, UNDP has been carrying out a pilot project named "Participatory Disaster Management Program (PDMP) in four of the disaster prone districts of Nepal. The programmes works with the local community to mitigate water-induced disasters based on indigenous knowledge and locally available materials. The program, based on the experience of a similar earlier a year long program called "Upgrading Disaster Management Capacity in Nepal" (1996-1997), aims to combine modern knowledge and indigenous knowledge in disaster preparedness and mitigation with the goal of building community capacity in a participatory, sustainable and cost-effective manner.

One of the success stories of this project was seen in the Chitwan district of Nepal. During this phase, flood management through micro-infrastructure like dyke construction was carried out. Also in other area biological measures such as flood control management through

large scale plantation, protection of degraded forest, proper drainage of excess run off water etc were adopted. Community itself selected the variety of plants that were to be used in that area. Also, the majority of the community in the project area, basically Tharu, an indigenous people was found to be fond of fishing. Hence, with the assistance from the institute of Agriculture and Animal Science, Chitwan, the community in the project area constructed 25 family fish ponds which were able to reduce fish catching practices at natural streams and rivers. In this way a disaster torn community has been able to reduce the flood problem and are also generating financial resources through activities combining their local knowledge and with the help of UNDP's program.

Chapter 3
Objectives, Significance and limitation of the study

3.1 Objectives of the study:

The main objective of the study is to explore the use of indigenous knowledge and practices in Tharu community to reduce the impact of flood disaster. The study will try to show the importance to indigenous practices in disaster risk reduction practices.

Specific objectives of the research are as follows:

- ✓ To understand how the local knowledge is developed, used, transferred and adapted.
- ✓ To explore and indentify mechanisms which can be promoted to increase people's participation towards risk reduction.
- ✓ To understand whether the indigenous practices can be combined with scientific strategies in order to minimize the impacts of flood hazard in Tharu community.

Hence the research is expected to seek the answers to the following questions:

1. How do people traditionally know when hazards are coming or are transforming into disasters
2. Are people aware of any changes in climate related disaster?
3. What do people traditionally do to prepare themselves for such disasters? How effective are these measure in the current days?

3.2 Significance of the study:

Many people in Terai region go homeless and their agricultural land gets swept away due to inundation of floodplains by flash flood and drainage floods. The flood water also brings diseases and makes access to clean drinking water very hard. Large number of epidemics outburst during flood season. Also, people get bitten by snakes and there is huge scarcity of drinking water.

Flood of 1993 is considered as one of the major floods in Nepal. It caused massive destruction of life and property, thousands of people were homeless and it also destroyed crops over thousands of hectares of land. During this flood, 45 districts of the country were affected. The total loss of physical destruction was estimated to be Rs. 5 Billion. Similarly, other major floods of Nepal are the 1978 flood in the Tinao Basin, the 1980 flood along the Koshi River. Also, the central and eastern Terai was submerged during the flood of 1987 in Sunkoshi Basin (ICIMOD, 2007).

People always find ways to live with the environment using the knowledge they have gained through their ancestors. This knowledge is usually in the form of social practices and behaviors. In many countries these knowledge are manifested in the form of songs, folklores, and also proverbs which usually becomes the part of cultural beliefs and practices. Interpretation of such beliefs also gives us idea about why communities act differently.

Nepal is considered as one of the richest in terms of indigenous traditional knowledge due to its geographical diversities and many ethnic communities. Most of the indigenous knowledge is transmitted orally from generation to generation and there is lack of proper documentation. This is considered as one of the problems of integrating indigenous practices in DRR. This study will help to document the practices applied by Tharu community and will try to show significance of combining indigenous practices with new technologies. Such knowledge will then can be generalized and recommended for the other communities via similar other studies. Knowledge regarding strategies to cope against natural disaster can be transferred from one community to another community in the similar situations.

Indigenous people have lived in the vulnerable places for centuries adapting to the local climate. Tharus of Nepal are one of the oldest inhabitants of Terai region. They have been using their knowledge for years in order to reduce their impact and sustain their livelihood.

Tharu community in the Bardiya District of Nepal is one of the marginalized groups vulnerable to disaster. Tharus are the indigenous group who make up 52% of population in Bardiya District. They constitute one of the several indigenous groups that are historically marginalized and discriminated in Nepal. The marginalization of Tharu Community was due to lack of representation in Government and politics, language barriers and lack of access to

state protection and services. These groups are mostly affected by floods. In order to sustain their livelihood, these people occupy marginal and exposed land as they are cheaper for them to afford. Tharu community, an indigenous community living in Terai Landscapes, is well known for their traditional skills and knowledge. Tharus of Nepal are one of the oldest inhabitants of Terai region in the country. They have been using their knowledge and skills to cope with natural calamities. But with the changing climate, the local knowledge developed over centuries may not help to address rapidly emerging challenges. Their indigenous knowledge are limited to the regular phenomenon only.

This research will mainly focus on the indigenous strategies which have been practiced in this community. The paper will focus on the on going indigenous practices of Tharu community

3.3 Limitation

The study was conducted in three villages using FGD. The results presented here are the responses from the respondents of the study area. Therefore the findings are only valid for similar location and may not be generalized to other communities. Similarly, the information on climate change, impacts and local practices were the perceived responses of respondents based on their experience of the past. It may differ with the location and also within the different communities within the same district. The study focuses on the Tharu Community of Bardiya District which may not represent the other Tharu Communities of Terai region having different socio-environmental conditions. The limitations of the study include time constraints which is restricted to coverage of the study area.

Chapter 4 Methodology

4.1 Selection of Study Area:

The idea behind selecting this district for my study was due to the fact that this district has been affected by floods constantly. Bardiya district of Nepal is one of the most hazard affected districts of Nepal. Every year the districts suffer from intense flooding which disrupts lives of people, ruins agricultural lands and hundreds gets displaced. The district also faces various types of epidemic breakout which come side by side to flood.

In this district, the flood which occurred in 2008 affected 32 VDCs where 865 houses were completely damaged and 572 were partially damaged. I got interested in this particular district as news regarding flood in this area were being publish constantly.

Five VDCs at risk of inundation in Bardiya

AFP

BARDIA: Rise in water level in the Karnali river following incessant rainfall since the past four days has put five VDCs at risk of inundation in the Rajapur area of the district.

Chediya, Tedia, Anantapur, of Rajapur, Bhalufata, Shankerpur, Iswarigunj of Bhimmapur, Khaireni of Daulatour and Dangpur of Gola are at risk being submerged by the flood water.

The Rajapur area is surrounded on all sides by the Bheri and Karnali River.

High alert has been exercised considering the increasing level of water in the rivers, Chief of the Area Administration Office, Rajapur, Arjun Subedi said.Armed Police and Nepali Police personnel are on a stand-by position in case a situation arises to rescue the flood victims, Police Chief Surya Prasad Upadhyaya said. Meanwhile, two people have gone missing after being swept away by the Karnali River. One of the missing has been identified as Tilak Khadka, 50, of Asaneri in Motipur-4. The detail of the second person is not yet known, the District Police Office, Bardia said.

Fig 4.1 Adapted from the Himalayan Times newspaper, published at 2010-08-23

Among the various VDC of the district, I chose Rajapur Village Development Committee as it is one of the oldest settlements for Tharu community and also has been affected by flood many times. The VDC's are divided into nine wards on the basis of population size. A ward is the smallest administrative unit consisting of one village or groups of village. Since my study was on the indigenous strategies for flood hazard, out of 9 wards, I chose three wards which were easier to reach and was vulnerable to flood hazard.

4.1.1 An overview of Study Area:

Bardiya District is located in the Terai of the Mid-western Development region, Bheri zone. The district covers an area of 2,025 km2 and according to the Central Bureau of Statistic CBS 2001, the total population of Bardiya is 382, 649 out of which 189,994 are female and 192,665 are male that are distributed in 59,569 households. It is a fertile plain land covered with agricultural land and forest. The district is split into two distinct sections: the main land of Bardiya and the Rajapur Delta. Rajapur Delta is 37 kilometers west of Gulariya and has historically been and area of frequent flooding due to extensive network branches from the Karnali River.

Rajapur area within Bardiya District is known for being pre-dominantly settled by Tharu people. It is said that most of the Tharus in this area are first or second generation migrats from Dang district of Nepal. The total population of Rajapur area as per 2001 census is 92,908 in 13,303 households. This consists of 24.3% of the total population of Bardiya District. More than 50 different caste/ethnic groups reside in the area (CBS, 2001) among which the proportion of Tharus in the area is 69.8% which is one of the highest concentration of Tharus in the whole country (Chettri, 2008).

The main source of livelihood in the study area is agriculture. Some other sources of livelihood are found to be seasonal labor, services and business,

Fig 4.2: Area map of Rajapur VDC

4.1.2 An overview on Tharu population

According to CBS report of 2001, the total percentage of Tharu in Nepal is 6.75%. In Bardiya District there is 52% of Tharu ethnic group out of total population. Tharu people mostly reside in the close proximity to the forest and near the river in the past. This is due to their dependency on products for firewood, close access to wild medicinal plants used to cure diseases and agriculture and fishery as their main source of income for livelihood. In the past, their life was semi-nomadic form.

It is believed that Thar, the desert land of Rajasthan, India is ancestral homeland of Tharus from where they fled away. As they migrated from Thar in between thirteenth and sixteenth century during Muslim invasion, they became Tharu. (Pandit, 2007)

Singh (2006:13) clarifies that Tharus are the descendants of Sakyamuni Buddha and Asokha the Great and they cannot be branded as a tribal community. According to Laxmi lal Chaudhary, Tharus are the indigenous people and they belong to Lord Buddha's clan. They posses their own distinct identity, unique traditions and exclusive customs and also have their own beliefs. The Tharus call themselves the son of the land (Dharti Putra). They are the original settlers in the entire Terai plains. In 1950s, when there was severe Malaria outbreak in various regions of the country, it was Tharus who adapted.

Tharus in terai region have their own indigenous institution and governance mechanism which is known as "Barghar" system. This village leadership is selected during the 'Maghi' festival which is New Year for them. Barghar is selected by villagers for a year. The Barghar's position is voluntary whereas villagers pay paddy to the others to acknowledge their services. The traditional roles of Barghars include coordinating with community members to identify and prioritize community development needs or activities and to manage community labor (tharuculture.blogspot.com). Disputes in communities are also resolved by barghars.

Even though Tharus have been residing in Terai region and have been adapting to the climatic variation from the ancient time, their lives have started to be affected by climatic anomalies which is more likely to be damaging in the near future.

4.2. Methodology

Methodology includes the methods which can be used to obtain the desired data. It's a plan of action. It can also be known as a strategy to conduct the research. For ensuring a quality research, priority was given in developing appropriate research methodology as per the objectives of the research. Literature review of similar research project was done which was helpful to develop definite research methodology and research tools.

4.2.1 Data Collection Methods and Instruments

The study used the participatory tools and methods in order to generate information about climate change impacts and indigenous strategies used by the local people. Required data were obtained from primary and secondary sources. The primary data were acquired from field visits while the secondary data were extracted from books, reports, publications etc. For the collection of primary data, field visit was carried out. The specific instruments used in this study are as follows:

Focus Group Discussion

It is considered as one of the important data gathering tool. It is used to discuss specific topic in detail. FGD is a qualitative study method that requires a small homogenous group of people to discuss a study topic. It is also known as an exploratory research tool and is being widely used by researches to generate qualitative data. Focus group discussion was held in the three different wards of the Rajapur Village with local elder people, farmers, Barghar as well as social workers. Total of four group discussions were carried out. During FGD, participatory tools like social mapping, timeline and local knowledge documentation were applied.

After finalizing different years of flood using time line, information regarding impact of flood was also collected from the members. The participating community people provided the requested information based on their recall on past and present experiences on the study topic in each FGD.

Observation:

Systematic observation was carried out in order to gather the required information. Information on various features for getting insight view of consequences of flood hazard and

local practices and methods adopted by people to cope up was gathered via observation. Participation observation adopted to understand more about Tharu community everyday life, behavior, livelihood strategies, cultural practices and tradition. I also tried to know about the livelihood strategies of Tharu in their day to day life with the help of participation observation methods. This method helped to understand more about Tharu community in detail.

Extensive Literature Review

For secondary data collection, publications and reports, review of published reports, documents and researches related to indigenous practices was done. The extracted documents were then analyzed. All the facts regarding local knowledge and practices were reviewed via doing in-depth study in the subject matter. It was then related with disaster risk reduction practices. Also, the data published from Central Bureau of Statistics were used to analyze the socioeconomic status of the study area.

4.2.1 Data Analysis

Qualitative information such as farmers' experiences regarding climate change and adaptation measures taken on their farmland collected from local people and key informants were analyzed and interpreted in relevant chapters to complement.

Chapter 5 Findings and Discussions

5.1 Indigenous Knowledge for disaster Risk reduction

Due to geographical diversity and presence of many ethnic communities, Nepal is considered as one of the richest in the terms of indigenous traditional knowledge. This knowledge has been passed down from generation to generation and is proven to be very useful in case of coping with the natural events.

It is found from the literatures that local people are aware of the changing climate and they devise their own adaptation measures based on their cultural practices and past experiences. Understanding the local perception is useful in understanding the true implication for changing climate. Climate change and its impact are already visible in Nepal. Indigenous people whose livelihood is based on the state of natural resources are mostly impacted when such changes occur. The relationship between knowledge, culture and beliefs is important in context of DRR, since the belief system often incorporates environmental ethics which helps to reduce risk of disaster.

Absence of proper policy formulation and implementation as well as strategic plan for the prevention and preparedness is one of the main challenges of disaster management in Nepal. The country is still in the period of political transition. Due to unstable political situation and lack of proper coordination among authorities, national plan for disaster management has not been implemented successfully.

Also, disaster risk reduction initiatives in Nepal face the constant challenge of the country's relative poverty and the increasing competition for resources for economic development at both national and local level (IFRCC, 2011). There is need to integrate indigenous practices in DRR.

Table 5.1 Some of the indigenous practices used in Nepal:

Sector	Approaches
Farming	Use of organic fertilizers Use of 'tiet-pati' plant to control pest Changing crop cycle Use of organic fertilizer Use of flood resistant rice in terai region Plant crops demanding less rainfall Indigenous seed saving
Water Conservation	Preserving trees around water source Water harvesting from rain and river Developing irrigation system
Flood	Building double storey house Storing seeds on upper level to avoid flood damage Rearing cattle on higher grounds Capturing upland forest land Temporary migration upland
Building Methods	Building double storey house Storing seeds on upper level to avoid flood damage Building orientation to avoid storm damage

5.2 Local People's response to Climate Change

Majority of the local people responded that they have experienced change in climate with increasing temperature. More than 80% of the respondents reported rainfall variability with untimely rainfall, late monsoon, no rain or high intensity rainfall pattern within short duration. People responded in the past i.e 10 years ago, people knew the pattern of rainfall and could tell when the rainfall would occur. But at present rainfall pattern was unpredictable.

In 1986, Rajapur Village was ruined by disasters including fire and flood. Heavy flooding destroyed three houses and damaged fertile agricultural land. Forestland was cleared to allocate space for victims and flood prone households. The dense mixed forest in the area was destroyed. A total of 7.7 ha of forest were damaged.

Impact on forest and biodiversity

Forest is also an important sector of Tharu communities as they are still depending on it for various livelihood options. It is also in critical condition due to climate induced changes.

People are moving to the higher grounds which are resulting in massive clearance of forest area for settlement purposes.

Physical and social impacts Impact on physical infrastructures

Climatic risk and hazards especially flood, river bank erosion and windstorm has severe impacts on infrastructures like buildings, bridge, roads and even houses. Houses get inundated during flood; also there is a risk of roofs getting blown away during heavy storms.

Human casualties

Tharus of the studied sites indicated that climate risk and hazards had also impacted on human casualties and injuries in some cases. One of the farmers also informed that they have to stay alert whole night at the time of monsoon and/or intense rainfall as they do not have any proper or scientific early warning system in their village.

5.3 Flood Problems in Study Area

A flood may be defined as a discharge of excessive water which exceeds the channel capacity. Flood has remained a problem for Karnali River for years. As learnt form the discussion with the locals in the study area, floods of heavy magnitude have created big destruction in the past as well. Recurrence of flood is common during the monsoon season. It is learnt that the area is under inundation and the flooding is increasing in the study area since last 30-40 years.

Table 5.2. Time line for flood in the study area.

Year	Impacts
1960	Agricultural land was inundated. Temporary embankment methods by putting sands in plastic bags near river banks were introduced after the flood.
1983	Agricultural land inundated, heavy loss of crop production, seasonal migration was seen
1986	Flooding on November; damage of crop that was ready to harvest; outbreak of water borne disease like pneumonia, fever and diarrhoea.

1989	Problem of inundation, houses and stored grains were destroyed
1996	One man was taken away by the flood.
2008	People were affected from water borne disease like diarrhoea, dysentery; flood killed large number of cattles; many houses were inundated.
2009	Huge number of livestock was killed; people had difficult time traveling via boats.
2010	Roads were damaged, agricultural as well as paddy fields were destroyed. Flooding occurred thrice within a same year which made it difficult for the farmers to cultivate paddy.

Source: Discussion with locals in FGD

Table 5.3. Factors contributing to Flood disaster in Bardiya District as Perceived by locals.

Natural	Anthropogenic
• High rainfall intensity in recent years • Intense and concentrated rainfall over a short period of time • Debris flow	• Deforestation • Poor planning and design of embankments • Construction of Dam in Girjapuri of India

Flood disaster is prominent in the study area. Each year flood causes massive destruction on agricultural land, infrastructure and live stocks. Basically two type s factors were seen which contributed to the flood disaster in the study area, Natural and Anthropogenic. Among the major cause of flood, heavy monsoonal rain is the direct cause. Besides this other causes are found to be climate change, river bed rise and infrastructure. According to the locals, the intensity of rainfall has increased in the past few years. Though there are fewer rainfalls, intensity of those rainfalls are higher which is contributing to increase in the level of river which is ultimately contributing in the flood. Deforestation, and poor planning and designs of embankments are other factors. The community people respondent that due to migration of people from different areas and due to growth of population in the study area, deforestation has increased. Before, due to the forest, there was less chance of flood water entering the village. But now since there is little forest, there are no natural ways to reduce the impact of flood.

Locals also expressed the need of improving the embankments. According to them, embankment should have more slopes and the materials used should be stronger. One of the other reasons for flood in that area, according to the locals is the building of Girjapuri dam in India. During intense rainfall, if these damn were opened, there would have been less change for flood to enter the study area.

During the FGD, people stressed that flood damages physical infrastructures. Their main concern is the damages to the productive agricultural land and livestock. Since more than 85% of people directly depend on agriculture, river cutting issues has been of great concern. The flood also caused losses of livestock.

5.4 Local knowledge on Flood

It has been found that local people of the study area are using their beliefs, local knowledge practices for forecasting of storms and rainfall, early warnings as well as for emergency management. This knowledge has been passed down to them from previous generations orally. Their forefathers used to adapt to natural hazards based on their own surviving skills. However, the efficiency of traditional flood management practices is now being questioned in this changing environment. It is important to develop the current level of awareness while enhancing traditionally accepted system. This is possible by integrating scientific knowledge in to the existing system with understanding by local people.

5.4.1 Forecasting of storms and heavy rainfalls

It was found that many people these days use the support of weather forecast report from radio stations about the forecast of rainfalls. But still lots of own ways for forecasting was found. Some of the indicators for the people for forecasting heavy rainfall and flood as shared by locals in the field study are:

- Abnormal crying/voices of animals and birds
- Mobility of ants to the higher grounds
- Chickens spread out their wings in order to dry them up
- Increased level of river level
- In a backside of certain type of an insect, straws get stuck. By looking at the number of straws, size of flood is assumed.

5.4.2Early Warning Practices

No effective or scientific way for early warning system was seen in the study area. Nevertheless, there were some general practices that were seen. Some of the local or indigenous knowledge on early warning were documented during the field visits which are as follows:

- Strange sounds from rivers: Community people identify the sound of heavy flood upstream, based on their prior experiences. Once they are confirmed that there is a flood, firstly the 'Barghar' is given the notification after which the information is passed out to the entire community.

- Smell of the river: Muddy smell or different type of smell in the water is considered as another indicator for flood. Locals responded that usually during flood the river carry mud or soil due to which the river smells differently. Also, colour of the river is different.

- Presence of materials in the river water: When the water level increases, flood carries dry leaves, mud and other materials along the river. These are also taken as indication of increasing water level.

Farmers are determined and initiated to minimize the impacts of climate change in forest sector both individually and collaboratively. In this case, they have planted Bamboo, *Khar*, *Munj*, *Amriso* in flood prone areas and also initiated bio-fencing with support of different stakeholders.

5.4.3 Flood Management Practices

It has been found that local people are using traditional way of embankment. They have been using Zhaala Paata (embankment made using branches of trees, various sticks) for reducing impact of flood. This method was proved to be very effective many years back. According to locals, it is very affordable method and was greatly used by their ancestors before. However, it is only effective for three months as it dries up after three months. Before when the monsoon season was predictable, it was enough to stop the flood from entering the village.

But now in some of the places, where the land cutting issues are more severe, people were found to use stones and gabion wires for embankment.

Besides this, some of the house holds at present has changed their house structure by building in higher elevated area or increasing the plinth of the houses. Tharu community in the terai has a tradition since long past to store rice grains in every household I amount atleast sufficient for six months. They sue a locally designed earthen structure called “Deheri” to store grains so that it will not deteriorate for long time. In the study area similar practice was seen. However, in this area, ‘Deheri’ was not only used for storing grains and it was built in such a way hat it would act like a protective wall for the house.

Communities have also managed the forest as a community forest. They have the belief that forest would act like a savior to them and would protect them for the flood. They have also made cannel irrigation for crop production as well as to divert excess water form the river to different river.

Fig 5.1. Temporary Embankment in Study area

Fig 5.2. Use of Gabion Wires and Stones for embankment

5.5 Agencies Involved in Flood Risk reduction in the study area

District Development Committee (DDC) is considered as one of the major line agency for the government entrusted with development work in all of the VDCs of the district. Activities of NGOs and INGOs were severely affected during on going conflict (Maoist Insurgency period). Even after the initiation of peace building in the country, the involvement of NGOs and INGOs in the study area was seen to be limited. Also in terms of flood management,

mostly activities conducted in the study area are related to response, recovery and relief rather than prevention and preparedness.

Presently, Red Cross and local NGOs; SCORE Nepal and Radha Krishna Seva Samaj are working to create awareness regarding flood issues in the area. They basically give trainings to social workers of the area regarding how to act after the occurance of the disaster. According to the respondents, they along with the help of Red Cross, are planning to get a Siren which would help them in early warning.

5.7 Strengths and Weakness of IK

Upon discussing with the local people and observing the local practices, some of the strengths and weakness of integrating local and indigenous practices in Disaster Risk Reduction Practices were found which are mentioned below:

Strengths:

- Understanding local knowledge and practices can help to identify what is the need and what are accepted locally. In the case of Rajapur VDC, people had various ideas in order to reduce the risk of flood hazard. After the flood in 1960, locals accepted the use plastic bags full of sand along the river side for temporary embankment which were distributed by the Nepal government.
- It can help to understand the factors which may increase people's participation.
- Building on local knowledge and practices can decrease dependency on external aid. People themselves seemed to be active to try various techniques for flood management.
- Local human resources as well as natural resources will be mobilized. It will promote mutual trust, understanding and community's sense of ownership.
- It can also help organizations to implement their projects activities and strategies as per the local partner's needs.

Weakness:

- One of the problems of integrating indigenous knowledge in disaster risk reduction is that such knowledge are transmitted orally from one generation to another generation. Hence, proper documentation cannot be found. In the absence of documents, this kind

of knowledge cannot be generalized and recommended for use unless they are tested and proved to be valid in the changing context.

- Scientific monitoring and forecasting and warning systems are proven to be more reliable. The locals in the area themselves agree to the fact that relying only on the traditional way of forecasting and early warning system is not enough as they might not be accurate due to on going climate change.
- Traditional coping strategies are also inadequate for the events that occur suddenly and in massive scale. Respondents replied due to change in rainfall pattern and increased intensity of rainfall, they cannot predict the flood every time. Sometimes flooding occurs within a short period of time which makes the locals difficult to cope only using the traditional strategies.

Chapter 6 Conclusion and Recommendation

6.1 Conclusion

Study found that Tharus in Rajapur VDC were able to recognize that temperatures have increased, snow fall decreased and there has been a fluctuation in the rainfall pattern. Inadequate scientific monitoring makes it difficult to validate the observed changes. Natural resource degradation and poverty are already severe problems in Nepal, and there will be more severe problems in future if present scenario continues. Though indigenous practices are found to be present in the area, it is not adequate for risk reduction for flood. According to the community people, the ways and methods were useful few years back when they could predict the rainfall and could tell about upcoming flood. But now since variation in climatic conditions are seen, only relying in these practices are not enough.

Indigenous communities have a large and diverse body of knowledge on disaster risk reduction based on traditional wisdom. Since they live in remote, isolated and inaccessible areas on the ridges or on the foothills, they have their own coping strategies in times of disaster. Detailed, systematic and intensive studies on indigenous knowledge would contribute to a more comprehensive understanding and appreciation of their overall contribution for better and safer living conditions of the people. (UN/ISDR, 2008)

Local knowledge and practices are often invisible to outsiders. Many techniques remain confined within particular community only. Hence efforts should be made to bring out those practices. One of the main problems of integrating Indigenous Knowledge in Disaster risk reduction is lack of proper documentation. Hence, first essential task to be done is to document such knowledge and practices in all dimensions let it be technical, cultural, social or economic.

The time tested knowledge possessed by various communities is need to be linked with scientific knowledge. Mainly, it should be a two way process in which scientist learns from indigenous knowledge. Mainly, it should be a two way process in which scientist learns from

indigenous coping mechanisms and on the other hand communities are also benefited with modern and scientific knowledge which reduced their risk towards extreme events.

6.2 Recommendations

- ✓ There should be policy and legal frameworks for incorporating traditional knowledge practices.
- ✓ There should be proper collection and compilation of traditional and local knowledge which are scattered throughout the country. Researches should be carried out in different community for the compilation of such strategies.
- ✓ There should be institutional mechanism for mainstreaming traditional knowledge into the disaster risk reduction practices
- ✓ Indigenous practices should be studied, analyzed and then documented in order to develop some kind of tools and methodologies for the application and test via some pilot projects.

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ANNEX

Tharu Women Discussing Indigenous Practices used in their areas.

Focus group discussion

Checklist for Focus Group Discussion

Namaste! My name is……. and I am here from……. to collect data for a study Use of Indigenous Knowledge in Strategies for Disaster Risk Reduction for flood disaster: The Study of Tharu Community in Bardiya District of Nepal
I will ask you some questions that will be about the practice of indigenous knowledge in your community. All the mentioned information will be used only for the study purpose.

BACKGROUND CHARACTERISTICS

Q.N.	Questions		Go to Q.N.
1	Name		
2	Name and address of your residence?		
3	How long have you been living continuously at this location?	**Year .....** Since 10 years…… **Always (since birth).....** **Others (Specify)_____ ...**	
4	How old are you?	**Age .....**	
5	What is your occupation?		
7	Record sex of the respondents (**Not to be asked)**	Male..... Female	

Questions related to Indigenous practices

Q.N.	Questions		
1	Have this community experienced any changes in climate within last 50-30 years?		
2	State what kind of changes		
3.	What were the impacts seen in the community?		
4.	What kind of impact did the flood had on your livelihood?		
5.	How was the community's reaction after the flood?		

Q.N.	Questions		
6	How is the community working to reduce the impacts of floods?		
7	What kind of indigenous practices are used for flood reduction?		
8.	Describe about these practices.		
9.	How did you come to know about these practices?		
10.	Is these practices enough for flood management? How do you feel about new and scientific methods?		
11.	Is there any organization which is working in this sector?	Yes….. No…..	

12.	In you opinion, what could be the best way to reduce the impact of flood in your area?		